ILLINOIS NATURAL HISTORY SURVEY
PRAIRIE RESEARCH INSTITUTE

# Freshwater mussels of the Illinois River tributaries: Upper, Middle, and Lower drainages

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INHS Technical Report 2013 (07)

**Prepared for:**

Illinois Department of Natural Resources: Office of Resource Conservation

U.S. Fish & Wildlife Service

Illinois Natural History Survey

Issued February 11, 2013

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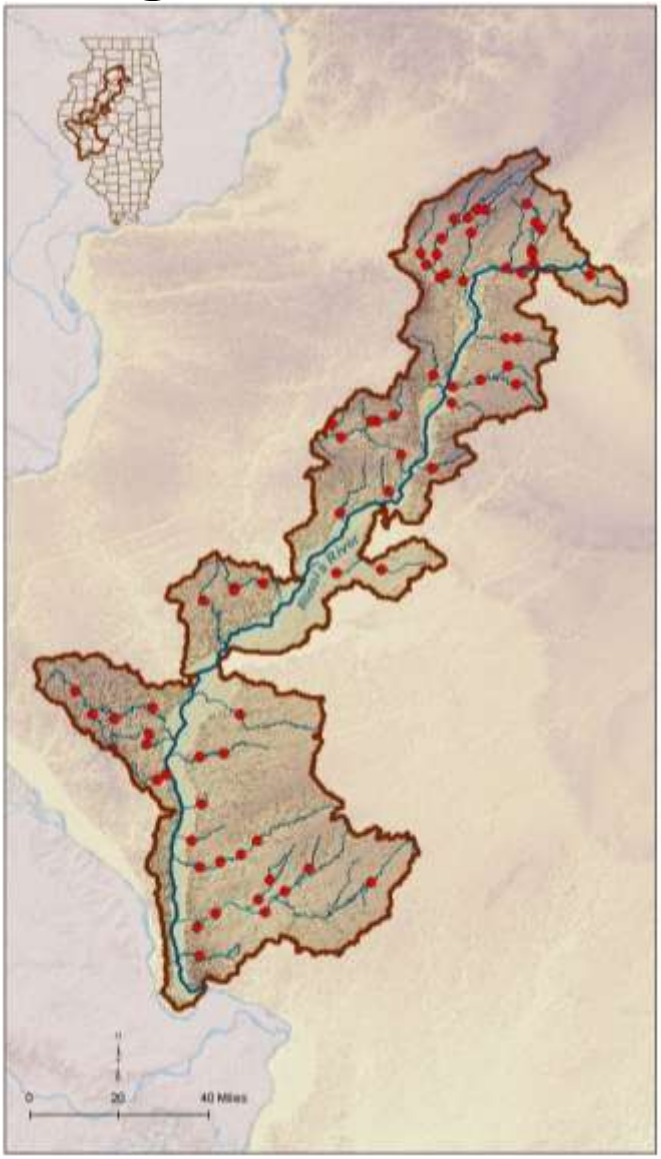


2013

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## Preface

While broad geographic information is available on the distribution and abundance of mussels in Illinois, systematically collected mussel-community data sets required to integrate mussels into aquatic community assessments do not exist. In 2009, a project funded by a US Fish and Wildlife Service State Wildlife Grant was undertaken to survey and assess the freshwater mussel populations at wadeable sites from 33 stream basins in conjunction with the Illinois Department of Natural Resources (IDNR)/Illinois Environmental Protection Agency (IEPA) basin surveys. Inclusion of mussels into these basin surveys contributes to the comprehensive basin monitoring programs that include water and sediment chemistry, instream habitat, macroinvertebrate, and fish, which reflect a broad spectrum of abiotic and biotic stream resources. These mussel surveys will provide reliable and repeatable techniques for assessing the freshwater mussel community in sampled streams. These surveys also provide data for future monitoring of freshwater mussel populations on a local, regional, and watershed basis.

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**Suggested Citation**
Stodola, A.P., D.K. Shasteen, and S.A. Bales. 2013. Freshwater mussels of the Illinois River tributaries: Upper, Middle and Lower drainages. Illinois Natural History Survey Technical Report 2013 (07). Champaign, Illinois. 21 pp + appendix.

**Acknowledgements**
This study was supported by funding from the US Fish and Wildlife Service, State Wildlife Grant (T-53-D-1, Investigating Mussel Communities in Illinois Streams), IDNR, and INHS. Our extreme gratitude goes to the primary investigators for the project: Ann Holtrop, Kevin Cummings, Robert Szafoni, and Dr. Yong Cao, who served as our mentors and made this project possible. We would like to thank all people involved in our surveys, especially our field assistants (Brittanie Dabney, Shawn Gibbs, Kacie Jonasen, Cassi Moody, John Pfeiffer, Hunter Ray, Melissa Ruether, Jen Schwab, Matt Walker, Corrina Wendel, and Rachel Vinsel), IDNR fisheries biologists, IEPA water monitoring biologists, and volunteers from other agencies. We would like to extend gratitude to all the land owners, both public and private, who allowed us access to their properties. We would like to thank Andrew Hulin for the creation of maps for this report and Christine Mayer for INHS Collection database support.

## Introduction

Freshwater mussel populations have been declining for decades and are among the most seriously impacted aquatic animals worldwide (Bogan 1993, Williams et al. 1993). It is estimated that nearly 70% of the approximately 300 North American mussel taxa are extinct, federally-listed as endangered or threatened, or in need of conservation status (Williams et al. 1993, Strayer et al. 2004). In Illinois, 25 of the 62 extant species (44%) are listed as threatened or endangered (Illinois Endangered Species Protection Board 2011) and an additional 5 species are species in greatest need of conservation (SGNC; IDNR 2005a). The Illinois River tributaries are comprised of the direct tributaries to the Illinois River (downstream of the confluence of the Fox River) and are broken into three sections for this report. We summarize the mussel surveys conducted in the Upper, Middle, and Lower Illinois River tributaries from 2009 to 2012 at IEPA/IDNR basin survey sites and previously-ranked disturbance sites.

### Location and Natural Division

The Upper Illinois River tributaries are located in north-central Illinois and contain the drainages of Big Bureau Creek, Little Vermilion River, and several tributary creeks. The Upper Illinois tributaries drain most of LaSalle and Bureau Counties and flow through the Grand Prairie and Illinois River Bottomlands natural divisions (Schwegman 1973). The Middle Illinois River tributaries are located in central Illinois and contain the drainages of Sandy Creek, Kickapoo Creek, and several other tributaries. These streams flow through portions of Fulton, Marshall, Mason, Peoria, Schuyler, Tazewell, and Woodford Counties. The Middle Illinois tributaries flow through the Grand Prairie, the Illinois River Bottomlands, and the Galesburg section of the Western-Forest Prairie natural divisions (Schwegman 1973). The Lower Illinois River tributaries are located in south-central Illinois and are comprised of the drainages of Macoupin and McKee Creeks and several minor tributaries to the Illinois River. The Lower Illinois tributaries flow through portions of Adams, Brown, Greene, Jersey, Macoupin, Morgan, Pike, and Scott Counties. The Lower Illinois drainage flows through the Galesburg and Carlinville sections of the Western Forest-Prairie, the Illinois River Bottomlands, and the glaciated section of the Middle Mississippi Border natural divisions (Schwegman 1973).

### Land use and Habitat

These streams flow through a large portion of northern and central Illinois, thus different land forms and land uses are encountered. Many of the streams in this region have highly varied topography as the streams make their way to the Illinois River, thus steep banks and v-shaped valleys are common. Concurrently, streams in the floodplain may exist as slow-moving, low gradient streams. The streams in the Upper and Middle Illinois drainage have not, in general, been dredged or straightened, and stream types vary from rocky streams with out-croppings to

low gradient streams with soft banks. Some streams in the Lower Illinois have been dredged and channelized (e.g., Indian, Sandy, and Macoupin Creeks). Seasonal flooding exists throughout the drainages, and, conversely, certain streams and reaches experience seasonal desiccation (Figure 1). These hydrologic extremes create areas that are inhospitable to freshwater mussels. Instream habitats range from rocky streams dominated by boulder and cobble (particularly in the Upper Illinois drainage) to streams primarily comprised of sand and silt (especially in the Lower Illinois drainage; Figure 1).

Throughout the region, land use is primarily row crop and livestock agriculture. Because of the intensive agriculture, some threats to aquatic habitats exist in the forms of bank failure from extensive pasturing, excessive siltation and turbidity, agricultural chemical runoff, and high levels of nitrates (Page et al. 1992). Additionally, coal, gravel, and sand mining exists throughout the region and acid mine drainage has had a negative influence on several waterways (Page et al. 1992). Urban areas are few, although Peoria (population 115,000; US Census Bureau 2010) sits in the midst of the region on the banks of the Illinois River and contributes domestic and industrial wastes to Kickapoo and Farm Creeks (Page et al. 1992). Municipal wastes from other smaller municipalities persist throughout, such as to Mauvaise Terre Creek from Jacksonville (population 19,446; US Census Bureau 2010).

## Methods

Freshwater mussel data were collected at 70 sites between June and September of 2009-2012: 21 sites in the Upper Illinois tributaries, 23 sites in the Middle Illinois tributaries, and 26 sites in the Lower Illinois tributaries (Figure 2; Table 1). Locations of sampling sites are listed in Table 1 along with information regarding IDNR/IEPA sampling at the site. Site locations for mussel surveys matched those of IDNR/IEPA basin survey sites when applicable.

Live mussels and shells were collected at each sample site to assess past and current freshwater mussel occurrences. Live mussels were surveyed by hand grabbing and visual detection (e.g., trails, siphons, exposed shell) when water conditions permitted. Efforts were made to cover all available habitat types present at a site including riffles, pools, slack water, and areas of differing substrates. A four-hour timed search method was implemented at each site (Table 1), unless conditions precluded a four-hour timed search (e.g., dry stream bed, water depth of >1m, or presence of chemical odor or other unsafe conditions). Sites that were sampled for less than four hours were noted in Table 1.

Following the timed search, all live mussels and shells were identified to species and recorded (Table 2). For each live individual, shell length (mm), gender, and an estimate of the number of growth rings were recorded. Shell material was classified as recent dead (periostracum present, nacre pearly, and soft tissue may be present) or relict (periostracum eroded, nacre faded, shell

chalky) based on condition of the best shell found. A species was considered extant at a site if it was represented by live or recently dead shell material (Szafoni 2001). The nomenclature employed in this report follows Turgeon et al. (1998) except for recent taxonomic changes to the gender ending of lilliput (*Toxolasma parvum*), which follows Williams et al. (2008; Appendix 1). Voucher specimens were retained and deposited in the Illinois Natural History Survey Mollusk Collection. All non-vouchered live mussels were returned to the stream reach where they were collected.

Parameters recorded included extant and total species richness, presence of rare or listed species, and individuals collected, expressed as catch-per-unit-effort (CPUE; Table 2). A population indicated recent recruitment if individuals with lengths less than 30 mm or with 3 or fewer growth rings were observed. Finally, mussel resources were classified as Unique, Highly Valued, Moderate, Limited, or Restricted (Table 2) based on the above parameters (Table 3) and following criteria outlined in Table 4 (Szafoni 2001).

## Results

### Species Richness

A total of 31 species of freshwater mussels were observed in the Illinois River tributaries, 25 of which were live (Table 2d). Across all sites, the number of live species and extant species collected (live + dead) ranged from 0 to 12 and the total number of species collected (live + dead + relict) ranged from 0 to 14. Examined by drainage, the Upper Illinois drainage species richness ranged from 0 to 4 live and extant, and 0 to 12 total species. Species richness for the Middle Illinois drainage ranged from 0 to 8 live species, 0 to 12 extant species, and 0 to 14 total species. The Lower Illinois drainage species richness ranged from 0 to 12 live and extant species and 0 to 14 total species. Across all sites in the Illinois tributaries, the fragile papershell (*Leptodea fragilis*) and white heelsplitter (*Lasmigona complanata*) were the most widespread species, collected at 15 and 16 of 70 sites, respectively (~22%; Table 2d). In the Upper Illinois drainage, the cylindrical papershell (*Anodontoides ferussacianus*) was the most widespread species, collected at 3 of 21 sites (14%; Figure 3a). In the Middle Illinois drainage, the fragile papershell and white heelsplitter were the most widespread species, collected at 6 of 23 sites (26%; Figure 3b). In the Lower Illinois drainage, the most widespread species was the fragile papershell, which was collected at 10 of 26 sites (39%; Figure 3c).

### Abundance and Recruitment

A total of 1089 individuals were collected across 70 sites, and the number of live individuals collected at a site with live mussels detected ranged from 1 to 298. By drainage, the range of live individuals collected at a site ranged from 1 to 130 in Upper Illinois drainage sites (total

n=207), from 1 to 69 at Middle Illinois drainage sites (total n=151), and from 1 to 298 in Lower Illinois drainage sites (total n=731). The most commonly collected species across all sites was the lilliput (n=233), which comprised 22% of all individuals collected (Table 2d). The slippershell mussel (*Alasmidonta viridis*) was the most commonly collected species in the Upper Illinois drainage (n=75; Table 2a), although all individuals were collected at one site (site 4). The white heelsplitter was the most commonly collected species in the Middle Illinois drainage (n=50; Table 2b). The lilliput was the most commonly collected species in the Lower Illinois drainage (n=225), although 215 individuals were collected at one site (site 49; Table 2c).

Recruitment for each species was determined by the presence of individuals less than 30 mm or with 3 or fewer growth rings. Smaller (i.e. younger) mussels are harder to locate by hand grab methods and large sample sizes can be needed to accurately assess population reproduction. However, a small sample size can provide evidence of recruitment if it includes individuals that are small or possess few growth rings. Alternatively, a sample consisting of very large (for the species) individuals with numerous growth rings may suggest a senescent population.

Recruitment observed at individual sites ranged from none to high across the basin; 60% of sites where live mussels were collected (i.e., 19 of 32 sites) had no observed recruitment (Figure 4). We observed recruitment in over 50% of species collected at several sites, including Tomahawk Creek (site 4), Kickapoo Creek (site 31), Jubilee Creek (site 33), Otter Creek (site 43), McKee Creek (site 49), and Macoupin Creek (sites 62 and 69). In some cases, however, only one live species was collected (Kickapoo Creek and Jubilee Creek). Both sites sampled on Apple Creek (sites 60 and 61) had observed recruitment of 30-50% of species collected.

**Mussel Community Classification**

Based on data collected in the 2009-2012 basin survey, 50% of the sites where mussels were collected (16 of 32 sites with mussels) in the Illinois River tributaries are classified as Moderate, Highly Valued, or Unique mussel resources under the current MCI classification system (Table 4, Figure 4). Two sites, Tomahawk Creek in the Upper Illinois drainage (site 4) and McKee Creek in the Lower Illinois drainage (site 49), stand out as Unique mussel resources. Sandy Creek in the Middle Illinois drainage (site 22) and Apple Creek in the Lower Illinois drainage (sites 60 and 61) were classified as Highly Valued mussel resources. Five sites in the Middle Illinois (sites 23, 24, 31, 33, and 43) and six sites in the Lower Illinois (sites 52-54, 62, 68, and 69) were classified as Moderate mussel resources.

**Noteworthy Finds**

This survey collected 25 live species and 31 total species; only 27 species were known historically from the Illinois River tributaries. Two species with historical records from this drainage that were not collected during this survey were the mucket (*Actinonaias ligamentina*),

and flat floater (*Anodonta suborbiculata*). Our survey found new records of six species: elktoe (*Alasmidonta marginata;* relict), rock pocketbook (*Arcidens confragosus*, n=2), flutedshell (*Lasmigona costata*; SGNC; relict), threehorn wartyback (*Obliquaria reflexa;* n=3), round pigtoe (*Pleurobema sintoxia;* relict), and pistolgrip (*Tritogonia verrucosa*; n=3). Other species represented in our surveys by relict shell include spike (*Elliptio dilatata*; state-threatened) and Wabash pigtoe (*Fusconaia flava*; Table 2d). Our survey also found relatively few or no live occurrences for washboard (*Megalonaias nervosa*) or pondhorn (*Uniomerus tetralasmus*).

The slippershell mussel, a state-threatened species, was found alive at a Tomahawk Creek site and as dead shell at the other Tomahawk Creek site (sites 4 and 5, respectively). The only other state-listed species encountered in our surveys were 2 relict spike shells collected at West Fork Kickapoo Creek (site 35) and Kickapoo Creek (site 32). Three species of greatest conservation need, rock pocketbook, creek heelsplitter, and ellipse, were collected alive at one or more sites throughout the Illinois tributaries.

## Discussion

### Upper Illinois tributaries

The Upper Illinois tributaries was the least species-rich drainage, with only 9 live species and 15 total species collected across all sites (Table 2a). Notably, we did not collect any live representatives from the subfamily Ambleminae, although the lack of relict shell collected indicates that these species may have always been rare in this drainage. Only 6 of 21 sites had live mussels; 11 of 21 had only dead or relict shell collected. At certain streams, such as Big Bureau Creek (sites 19 and 21), we collected 9 or more species of relict shell. Thus, these streams contained relatively diverse freshwater mussel populations historically, although these populations have not persisted. Some explanations for extirpation could be linked to water quality, since several streams in this drainage are listed as non-support for aquatic life by recent assessments by the IEPA. Factors cited for non-support include insufficient dissolved oxygen, pH, elevated total phosphorus, chloride, or zinc, elevated suspended solids, or unknown sources (EPA 2012). Other water quality issues in this drainage could be found in the fish tissue analysis, as elevated levels of mercury and polychlorinated biphenyls (PCBs) are found in five sites in this drainage. While they may not pose a direct threat to live mussels, accumulation of contaminants over time negatively affects viability of freshwater mussels (Naimo 1995; Bouchard et al. 2009).

### Middle Illinois tributaries

In the Middle Illinois tributaries, we collected 15 live species and 23 total species across all sites. Live mussels were collected at 12 of 23 sites, and 7 of these sites had only 1 or 2 live species

collected (often only 1 individual; Table 2b). The most note-worthy site in this drainage is Sandy Creek (site 22), in which we collected 14 total species and calculated an MCI of 14 (Table 2b; Figure 4). Sandy Creek and North Branch Crow Creek, located north of Peoria, maintain relatively diverse populations of freshwater mussels (e.g., between 5 and 12 extant species). Streams within and near Peoria had few, if any, live or extant species collected during our survey (Table 2b). Kickapoo Creek and Farm Creek (in Peoria) had impairments to aquatic life listed by IEPA (e.g., elevated levels of mercury, PCBs, chlorine, etc.), although few sites in this drainage were classified as non-support for aquatic life (EPA 2012).

**Lower Illinois tributaries**

The Lower Illinois tributaries had the most species-rich sites as well as the most individuals collected, compared to the other Illinois tributary drainages. Fourteen of the 26 sites sampled had live mussels, and nine of those fourteen were Moderate, Highly Valued, or Unique mussel resources under the current MCI classification (Table 2c). In addition, we found more than 50 live individuals at four sites, McKee Creek (site 49), Mauvaise Terre Creek (site 52), and Apple Creek (sites 60-61). These sites were also diverse, with 11, 8, 11, and 12 extant species at each site, respectively. This drainage is not without impairment, however, as several streams were on the EPA 303d list as non-support for aquatic life. Impairments cited include elevated levels of manganese, suspended solids, sedimentation and silt, and insufficient dissolved oxygen (EPA 2012). Twelve sites had no live or extant mussels collected, although relict shells were collected at five of those 12 sites (Table 2c).

**Historical species, Noteworthy Finds, and Recruitment**

Very few studies have been published regarding the freshwater mussel fauna of these tributaries. Hence, it is difficult to determine the intactness and/or historical fauna of these drainages. Nevertheless, we can partially infer the historical species richness from shell records and current shell condition. Twenty-seven species were known in the Illinois tributaries prior to our surveys, and we added six species records to this list (elktoe, rock pocketbook, flutedshell, pistolgrip, threehorn wartyback, and round pigtoe). While these species may have recently moved into these drainages, it is more likely that they previously existed here; lack of historical records makes inferences on a timeline nearly impossible. Several species were only collected as relict shell and have never been collected alive in these drainages, thus they may be extirpated from the region. These species include elktoe, flutedshell, spike, and Wabash pigtoe (Table 2d). With the exception of the state-listed spike, these species are considered stable in Illinois. Reasons for their decline may be contributed to water quality degradation (see above) or other unknown causes.

The state-threatened slippershell mussel was collected alive in our survey at only one site

(Tomahawk Creek, site 4), although we collected 75 live individuals. This made the slippershell mussel the most common mussel in the Upper Illinois tributaries. The density of slippershell mussels encountered in Tomahawk Creek is unusual, and it may be the largest documented population of the species in Illinois. The only other site with more than 50 individuals was in the West Branch DuPage River in 1958 where 55 live slippershells were found (INHS Mollusk Collection). This population should be considered worthy of further protection or conservation. It appears to be rare throughout the rest of the Illinois tributaries, although its known range limits it to only the Middle and Upper Illinois tributaries (Cummings and Mayer 1992).

Although we did not observe recruitment at the majority of sites sampled, several sites exhibited recruitment of several species. Of particular note is McKee Creek (site 49), since all 11 species collected were found as juveniles (0-3 years of age). Finding juveniles of so many species is unusual, and may have been attributed to extremely low water depths or a recent recruitment event. Regardless of the cause, high rates of recruitment should be noted and examined for persistence in the future. Other sites that displayed three or more species with recruitment were Macoupin Creek (5 species; site 69), Tomahawk Creek (3 species, site 4), and Otter Creek (3 species, site 43). Populations of diverse, reproducing mussels persist in several areas in these drainages and should be recognized for future preservation. Sampling methods to target juvenile mussels would be necessary to better assess the reproductive status of these drainages.

**Summary**

On the whole, the tributaries of the Illinois River covered in this report do not contain exceptionally diverse or abundant freshwater mussel resources. Less than half of the sites sampled (i.e., 32 of 70 sites) in our survey did not have live Unionids present, and nine sites had no shell material present (Table 2). The most widespread species collected in each these drainages (e.g., cylindrical papershell, fragile papershell, white heelsplitter; Figure 3) are among the most common species in the state (Cummings and Mayer 1997; Tiemann et al. 2007). Diversity of freshwater mussels populations in the tributaries of the Illinois River appear comparable to similar tributary streams of the Mississippi River (Price et al. 2013), and a myriad of factors likely contribute to the limited diversity. Among these factors are small watershed size (leading to seasonal desiccation), spring flooding, flow regime modifications, runoff from industry or agriculture, or effects of impoundments along the Illinois River (i.e, restricting fish host passage or altering instream habitats in floodplain streams; Baxter 1977, Watters 1999). While most species in this region are common and widespread in Illinois, our survey documented a few sites that contain relatively diverse, intact populations of freshwater mussels. Maintaining the present mussel community should still be considered a priority for this region.

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**Table 1.** 2009-2012 Illinois River tributary sites. Types of samples include MU-mussel sampling, W-water chemistry, H-habitat, M-macroinvertebrate, F-fish sampling, FF- fish tissue, S-sediment, D-discharge, CM- continuous monitoring. Abbreviated mussel surveys are noted as ([d]) if desiccated or ([s]) if deemed unsafe.

| Site number | IEPA Code | Stream | Types of Samples | County | Location |
|---|---|---|---|---|---|
| **Upper Illinois Tributaries** | | | | | |
| 1 | DZS-01 | Covel Creek | MU, W,H,M,F,FF,S,D,CM | La Salle | 3.5 mi S Ottawa, Hwy 23 bridge |
| 2[s] | DRD-M-C2 | Mendota Creek | MU | La Salle | 1.5 mi SSE Mendota, 3rd Rd. |
| 3 | DR-05 | Little Vermilion River | MU, W,H,M,F,D,CM | La Salle | 3.2 mi SW Triumph, Hwy 52 |
| 4 | DRA-01 | Tomahawk Creek | MU | La Salle | 2.25 Mi SSE Troy Grove, 3550N bridge |
| 5 | DRA-02 | Tomahawk Creek | MU, W,H,M,F,D,CM | La Salle | 2.9 mi NNE LaSalle, Mitchell's Grove Nature Preserve |
| 6 | DR-03 | Little Vermilion River | MU,W,H,M,F,CM | La Salle | 2.3 mi NNE LaSalle, N 30th Rd. |
| 7 | DR-01 | Little Vermilion River | MU,H,M,S | La Salle | LaSalle, Route 6 bridge |
| 8[d] | DZQ-04 | Cedar Creek | MU | La Salle | 1.6 mi S Peru, 1360N bridge |
| 9 | DZP-01 | Spring Creek | MU,W,H,M,F,D,CM | Bureau | 3.5 mi W Peru, Spring Valley |
| 10 | DQG-01 | Pike Creek | MU | Bureau | 1.5 mi S Lamoille, 2500N bridge |
| 11[s] | DQG-LM-C4 | Pike Creek | MU | Bureau | 2.7 mi WSW LaMoille, 2750E bridge |
| 12 | DQ-05 | Big Bureau Creek | MU,W,H,M,F,D,CM | Bureau | 4.2 mi N Malden, 2525E bridge |
| 13 | DQF-01 | Masters Fork | MU,CM | Bureau | 3 mi NW Dover, 2300N bridge |
| 14 | DQ-06 | Big Bureau Creek | MU | Bureau | 2 mi N Princeton, 1950E bridge |
| 15 | DQ-03 | Big Bureau Creek | MU,H,M,F,FF,D,CM | Bureau | 1.7 mi W Princeton, Hwy 6 bridge |
| 16 | DQD-01 | West Bureau Creek | MU,H,M,F,D,CM | Bureau | 5.5 mi W Princeton, off 1500E |
| 17 | DQD-02 | West Bureau Creek | MU | Bureau | 2.5 mi SE Wyanet, 1275N bridge |
| 18[d] | DQB-T-A1 | Plow Hollow | MU | Bureau | 1.1 mi E Of Tiskilwa, 980N bridge |
| 19 | DQ-01 | Big Bureau Creek | MU,W,H,M,F,D,CM | Bureau | 2.4 mi WNW Tiskilwa, 2050E bridge |
| 20 | DQA-01 | East Bureau Creek | MU,W,H,M,F,S,D,CM | Bureau | 1.3 mi NE Malden, 2000N bridge |
| 21 | DQ-04 | Big Bureau Creek | MU,W,H,M,F,D,CM | Bureau | 1 mi SW Bureau, Rt. 29 bridge |
| **Middle Illinois Tributaries** | | | | | |
| 22 | DP-05 | Sandy Creek | MU | Marshall | 2.6 mi SE Magnolia, Cumberland Rd bridge |
| 23 | DP-01 | Sandy Creek | MU,W,H,M,D,CM | Marshall | 1 mi S Magnolia, Rt. 89 bridge |
| 24 | DOB-TU-C3 | North Branch Crow Creek | MU | Marshall | 2.5 mi W Toluca, 2350E bridge |
| 25 | DOA-01 | South Branch Crow Creek | MU | Marshall | 4 mi SW Toluca, 2500E bridge |
| 26 | DO-02 | Crow Creek | MU,W,H,M,D,CM | Marshall | Wilbern, E Tax School Rd bridge |
| 27 | DO-01 | Crow Creek | MU | Marshall | 7 mi W Washburn, Rt. 26 bridge |
| 28 | DM-02 | Senachwine Creek | MU | Peoria | 3 mi NW Chillicothe, Shepherd Rd bridge |
| 29 | DZK-99 | Richland Creek | MU | Woodford | 4 mi SE Chillicothe, Rt. 26 bridge |
| 30 | DZZP-04 | Farm Creek | MU,W,F,M,H,CM | Tazewell | East Peoria, Reeser Rd. bridge |
| 31 | DL-05 | Kickapoo Creek | MU | Peoria | 1 mi S Dunlap, Rt. 91 bridge |
| 32 | DL-07 | Kickapoo Creek | MU,W,F,M,H,CM | Peoria | 2 mi NW Kickapoo, Grange Hall Rd bridge |
| 33 | DLG-01 | Jubilee Creek | MU,W,F,M,H,CM | Peoria | 2 mi NNW Kickapoo, Fussner Rd bridge |
| 34 | DLFC-01 | Walnut Creek | MU | Peoria | 2 mi NE Elmwood, McClellan Rd bridge |
| 35 | DLF-02 | West Fork Kickapoo Creek | MU,W,FF,F,M,H,CM | Peoria | 3 mi SE Elmwood, Dog Town Lane bridge |
| 36 | DL-06 | Kickapoo Creek | MU,W,FF,F,M,H,CM | Peoria | 0.3 mi S Pottstown, off Kickapoo Creek Rd. |
| 37 | DZIA-01 | West Branch LaMarsh Creek | MU,W | Peoria | 2 mi NE Mapleton, Rothlisberger Lane bridge |
| 38 | DZH-01 | Copperas Creek | MU,W,F,M,H | Fulton | 0.5 mi NW Banner, N Creek Rd. |
| 39 | DZGB-01 | Main Ditch | MU,W,F,M,H,CM | Mason | 5.4 mi SE Forest City, 3300E bridge |
| 40 | DZG-02 | Quiver Creek | MU,W,F,M,H,CM | Mason | 0.5 mi S Topeka, 2280E bridge |
| 41 | DI-01 | Otter Creek | MU | Fulton | 4 mi N Astoria, Co Rd 12 bridge |
| 42 | DIF-01 | South Branch Otter Creek | MU | Fulton | 3 mi SE Vermont, Co Rd 12 bridge |
| 43 | DI-02 | Otter Creek | MU,W,F,M,H,CM | Fulton | 2.5 mi NE Summum, Branson School Rd bridge |
| 44 | DH-04 | Sugar Creek | MU,W,F,M,H,CM | Schuyler | 2.5 mi NW Ray, Flatwoods Rd bridge |

**Table 1 (continued).** 2009-2012 Illinois River tributary sites. Types of samples include MU-mussel sampling, W-water chemistry, H-habitat, M-macroinvertebrate, F-fish sampling, FF- fish tissue, S-sediment, D-discharge, CM- continuous monitoring. Abbreviated mussel surveys are noted as ([d]) if desiccated or ([s]) if deemed unsafe.

| Site number | IEPA Code | Stream | Types of Samples | County | Location |
|---|---|---|---|---|---|
| **Lower Illinois Tributaries** | | | | | |
| 45 | DF-05 | Indian Creek | MU,W,CM | Morgan | 2.5 mi ESE Arenzville, Korsmeyer Rd bridge |
| 46 | DE-11 | McKee Creek | MU,W,F,M,H | Adams | 5.3 mi NE Liberty, 2500E bridge |
| 47 | DEJ-01 | Fishhook Creek | MU,W,F,MH | Adams | 2 mi SW Siloam Springs State Park, 2873 Rd bridge |
| 48 | DE-08 | McKee Creek | MU,W,F,M,H,CM | Brown/Pike | 7.5 mi WNW Perry, 000N |
| 49 | DE-03 | Mckee Creek | MU | Brown | 2.4 mi W Versailles, 275N bridge |
| 50 | DEAA-01 | Middle Fork McKee Creek | MU,W,F,M,H | Pike | 1.6 mi ENE Perry, Perry Springs Rd bridge |
| 51 | DEA-02 | South Fork McKee Creek | MU,W,F,M,H,CM | Pike | 1.5 mi S Perry, Route 107 bridge |
| 52 | DD-14 | Mauvaise Terre Creek | MU | Scott | 2.4 mi S Chapin, McGlasson Rd bridge |
| 53 | DD-05 | Mauvaise Terre Creek | MU,W,F,M,H,CM | Scott | Exeter, Exeter Rd bridge |
| 54 | DZC-07 | Blue Creek | MU | Pike | 2 mi N Detroit, 3650E bridge |
| 55 | DZC-01 | Blue Creek | MU,W,F,M,H | Pike | 2 mi N Florence, Ray Norbut State Fish & Wildlife Area |
| 56 | DC-04 | Big Sandy Creek | MU,W,F,M,H,CM | Scott | 4.5 mi SSW Winchester, Winchester Glascow Rd bridge |
| 57[d] | DZZZP-01 | Hurricane Creek North | MU | Greene | 0.5 mi SE Hillview, 460E bridge |
| 58 | DB-97 | Apple Creek | MU,W,F,M,H,CM | Greene | 7.5 mi E Whitehall, 2300N bridge |
| 59[d] | DBG-11 | Bear Creek | MU | Greene | 7 mi NW Greenfield, 2000N bridge |
| 60 | DB-95 | Apple Creek | MU | Greene | 3 mi S White Hall, Rt 67 bridge |
| 61 | DB-03 | Apple Creek | MU,W,CM | Greene | 6.2 mi NW Carrollton, 675E bridge |
| 62 | DA-11 | Macoupin Creek | MU,W,F,M,H,CM | Macoupin | 2 mi SE Standard City, Coops Mound Rd bridge |
| 63[d] | DAGC-01 | Solomon Creek | MU | Macoupin | 0.5 mi N Hettick |
| 64 | DAG-03 | Hodges Creek | MU | Macoupin | 3.5 mi NE Rockbridge, Chism Rd |
| 65 | DA-12 | Macoupin Creek | MU,W,F,M,H | Jersey | 5.1 mi NW Medora, end of farm rd |
| 66[s] | DAFA-GF-C2 | Rubicon Creek | MU | Greene | 1.5 mi S Greenfield, Fayette Rd bridge |
| 67 | DAF-01 | Taylor Creek | MU | Greene | 2.7 mi SW Rockbridge, Fitzsimmons Rd bridge |
| 68 | DA-10 | Macoupin Creek | MU,W,FF,F,M,H,CM | Greene | 4.2 mi NW Kane, 650N bridge |
| 69 | DA-13 | Macoupin Creek | MU | Greene/Jersey | 3.8 mi N Fieldon, Reddish bridge |
| 70 | DZA-02 | Otter Creek | MU,W,F,M,H,CM | Macoupin | 2 mi S Fieldon, Fieldon-Rosedale Rd bridge |

**Table 2.** Mussel data for sites sampled during 2009-2012 surveys (Table 1) in the Upper Illinois tributaries (a), Middle Illinois tributaries (b), Lower Illinois tributaries (c) and a summary of all sites (d). Numbers in columns are live individuals collected, "D" and "R" indicates that only dead or relict shells were collected. Shaded boxes indicate historic collections at the specific site location obtained from the INHS Mollusk Collection records. Extant species is live+dead shell and total species is live+dead+relict shell. Proportion of total is number of individuals of a species divided by total number of individuals at all sites. MCI scores and Resource Classification are based on values in Tables 3 and 4 (R=Restricted, L=Limited, M=Moderate, HV=Highly Valued, and U=Unique). NDA = no data available.

a. Upper Illinois Tributaries (sites 1-21)

| **Species** | Upper Illinois Tributaries | | | | | | | | | | | | | | | | | Proportion |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 3 | 4 | 5 | 6 | 7 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 19 | 21 | of total |
| **Subfamily Anodontinae** | | | | | | | | | | | | | | | | | | |
| *Alasmidonta marginata* | | | | | | | | | | | | | | | | R | R | - |
| *Alasmidonta viridis* | | | 75 | D | | R | | | | | | | | | | | R | 36.2% |
| *Anodontoides ferussacianus* | | 1 | 14 | R | D | R | R | 15 | R | R | | | | R | R | | R | 14.5% |
| *Lasmigona complanata* | R | | | | | | | | | 13 | D | | | | | R | R | 6.3% |
| *Lasmigona compressa* | | R | D | | R | | | 1 | | R | 2 | | | | | R | R | 1.4% |
| *Lasmigona costata* | | | | | | | | | | | | | | | | R | | - |
| *Pyganodon grandis* | | D | | | D | D | | | R | R | | | | | | R | R | - |
| *Strophitus undulatus* | | R | | | R | | | 1 | | R | 2 | D | R | | | R | | 1.4% |
| **Subfamily Ambleminae** | | | | | | | | | | | | | | | | | | |
| *Amblema plicata* | | | | | | | | | | | | | | | | | R | - |
| **Subfamily Lampsilinae** | | | | | | | | | | | | | | | | | | |
| *Lampsilis cardium* | R | 1 | | | D | D | | | | | | | | | | R | R | 0.5% |
| *Lampsilis siliquoidea* | | R | | | R | | | | | 25 | 6 | 8 | R | R | R | R | R | 18.8% |
| *Leptodea fragilis* | R | | | | | D | | | | | | | | | | | R | - |
| *Potamilus ohiensis* | | | | | | | | | | | | R | | | | | R | - |
| *Toxolasma parvum* | | | | R | | | | 1 | | | | 1 | | | | | | 1.0% |
| *Truncilla truncata* | | | | | | | | | | | | | | | | | | - |
| *Venustaconcha ellipsiformis* | | R | 41 | D | R | D | R | | | | | | | | | R | R | 19.8% |
| | | | | | | | | | | | | | | | | | | **Totals** |
| **Individuals collected** | 0 | 2 | 130 | 0 | 0 | 0 | 0 | 18 | 0 | 38 | 10 | 9 | 0 | 0 | 0 | 0 | 0 | 207 |
| **Live species collected** | 0 | 2 | 3 | 0 | 0 | 0 | 0 | 4 | 0 | 2 | 3 | 2 | 0 | 0 | 0 | 0 | 0 | 9 |
| **Extant species** | 0 | 3 | 4 | 2 | 3 | 4 | 0 | 4 | 0 | 2 | 4 | 3 | 0 | 0 | 0 | 0 | 0 | 11 |
| **Total species collected** | 3 | 7 | 4 | 4 | 7 | 6 | 2 | 4 | 2 | 6 | 4 | 4 | 2 | 2 | 2 | 9 | 12 | 15 |
| **Historical species richness** | NDA | NDA | NDA | NDA | NDA | 3 | NDA | NDA | NDA | NDA | NDA | NDA | NDA | NDA | NDA | NDA | NDA | |
| **Catch per unit effort (CPUE)** | 0 | 0.5 | 32.5 | 0 | 0 | 0 | 0 | 4.5 | 0 | 9.5 | 2.5 | 2.25 | 0 | 0 | 0 | 0 | 0 | |
| **Mussel Community Index (MCI)** | 0 | 4 | 17 | 0 | 0 | 0 | 0 | 7 | 0 | 6 | 7 | 6 | 0 | 0 | 0 | 0 | 0 | |
| **Resource Classification** | R | R | U | R | R | R | R | L | R | L | L | L | R | R | R | R | R | |

b. Middle Illinois Tributaries (sites 22-44)

| | Middle Illinois Tributaries | | | | | | | | | | | | | | | | | | | | Proportion |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Species | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 41 | 42 | 43 | 44 | of total |
| **Subfamily Anodontinae** | | | | | | | | | | | | | | | | | | | | | |
| *Alasmidonta viridis* | | | | | | | | | | R | | | | | | | | | | | - |
| *Anodontoides ferussacianus* | D | R | 4 | 3 | | R | | | | | | | | | | D | | | | | 4.6% |
| *Lasmigona complanata* | 36 | 1 | 8 | 2 | R | | | | | R | D | | 1 | R | | D | D | | 2 | | 33.1% |
| *Lasmigona compressa* | 1 | | D | R | R | | | | D | | D | 1 | | R | | | | | | | 1.3% |
| *Pyganodon grandis* | 22 | 1 | D | | | | | | | | | | | | | D | D | D | | | 15.2% |
| *Strophitus undulatus* | 1 | | | | | | 1 | | | | R | | | | | | | | | | 1.3% |
| *Utterbackia imbecillis* | 1 | D | | | | | | | | | | | | | | | | | | | 0.7% |
| **Subfamily Ambleminae** | | | | | | | | | | | | | | | | | | | | | |
| *Amblema plicata* | 4 | | 1 | | | | R | R | | | R | | R | | | D | | | | | 3.3% |
| *Elliptio dilatata* | | | | | | | | | | R | | | R | | | | | | | | - |
| *Fusconaia flava* | | | | | | | | | | R | | | R | | | | | | | | - |
| *Pleurobema sintoxia* | | | | | | | | | | | | | R | | | | | | | | - |
| *Quadrula quadrula* | R | | | | | | | | | | | | 2 | | | | | | | | 1.3% |
| *Uniomerus tetralasmus* | | | 1 | | | | | | | | | | | | | R | D | 1 | | R | 1.3% |
| **Subfamily Lampsilinae** | | | | | | | | | | | | | | | | | | | | | |
| *Lampsilis cardium* | | | | | | | 1 | | | | | | | D | | 1 | | | | | 1.3% |
| *Lampsilis siliquoidea* | | | | | | | | | | R | | | R | | | R | | | | | - |
| *Leptodea fragilis* | 3 | 2 | 5 | R | D | | | | | D | D | | 2 | D | | D | | 11 | 4 | R | 17.9% |
| *Ligumia subrostrata* | | | | | | | | | | | | | | | | | | | | R | - |
| *Potamilus alatus* | | | 2 | | | | | | | | | | D | D | | | | | | | 1.3% |
| *Potamilus ohiensis* | D | | | | | | | | | | | | D | D | | | | D | 3 | | 2.0% |
| *Toxolasma parvum* | D | | 1 | R | | | | | 2 | D | 3 | | R | | | D | | | | | 4.0% |
| *Truncilla donaciformis* | R | | | | | | | | | | | | D | | | | | | | | - |
| *Truncilla truncata* | D | | | | | | | | | | | | | | | | | | | | - |
| *Venustaconcha ellipsiformis* | 1 | 16 | | | | | | | | R | | | R | | R | | | | | | 11.3% |
| | | | | | | | | | | | | | | | | | | | | | |
| **Individuals collected** | 69 | 20 | 22 | 5 | 0 | 0 | 2 | 0 | 2 | 0 | 3 | 1 | 5 | 0 | 0 | 1 | 0 | 12 | 9 | 0 | 151 |
| **Live species collected** | 8 | 4 | 7 | 2 | 0 | 0 | 2 | 0 | 1 | 0 | 1 | 1 | 3 | 0 | 0 | 1 | 0 | 2 | 3 | 0 | 15 |
| **Extant species** | 12 | 5 | 9 | 2 | 1 | 0 | 2 | 0 | 2 | 2 | 4 | 1 | 6 | 4 | 0 | 7 | 3 | 4 | 3 | 0 | 16 |
| **Total species collected** | 14 | 6 | 9 | 5 | 3 | 1 | 3 | 1 | 2 | 8 | 6 | 1 | 13 | 6 | 1 | 9 | 3 | 4 | 3 | 3 | 23 |
| **Historical species richness** | NDA | 1 | NDA | NDA | NDA | NDA | NDA | NDA | NDA | NDA | 1 | NDA | NDA | NDA | NDA | NDA | NDA | NDA | 2 | 1 | |
| **Catch per unit effort (CPUE)** | 17.25 | 5 | 5.5 | 1.25 | 0 | 0 | 0.5 | 0 | 0.5 | 0 | 0.75 | 0.25 | 1.25 | 0 | 0 | 0.25 | 0 | 3 | 2.25 | 0 | |
| **Mussel Community Index (MCI)** | 14 | 9 | 10 | 6 | 0 | 0 | 4 | 0 | 8 | 0 | 9 | 4 | 7 | 0 | 0 | 6 | 0 | 7 | 10 | 0 | |
| **Resource Classification** | HV | M | M | L | R | R | R | R | M | R | M | R | L | R | R | L | R | L | M | R | |

c. Lower Illinois Tributaries (sites 45-70)

| | Lower Illinois Tributaries | | | | | | | | | | | | | | | | | | | | | | Proportion |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Species | 45 | 46 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 58 | 60 | 61 | 62 | 63 | 64 | 65 | 67 | 68 | 69 | 70 | of total |
| **Subfamily Anodontinae** | | | | | | | | | | | | | | | | | | | | | | | |
| *Anodontoides ferussacianus* | | R | | | | | | | | | | | | | | | | | | | | | - |
| *Arcidens confragosus* | | | | | | | | | | | | | R | 1 | | | | | | | | | 0.1% |
| *Lasmigona complanata* | | D | R | 5 | | | 13 | 3 | D | R | | | 35 | 22 | 2 | | 9 | | | R | 1 | R | 12.3% |
| *Lasmigona costata* | | | R | | | | | | | | | | | | | | | | | | | | - |
| *Pyganodon grandis* | | | | | | | R | | 1 | | | | 29 | 14 | | | D | 1 | R | R | 2 | | 6.4% |
| *Strophitus undulatus* | | | | | | | 6 | D | | | | | | | | | | | | | | | 0.8% |
| *Utterbackia imbecillis* | | | | 9 | | | | | 1 | | | | | | | | | | | | 1 | | 1.5% |
| **Subfamily Ambleminae** | | | | | | | | | | | | | | | | | | | | | | | |
| *Amblema plicata* | R | | R | 10 | R | R | R | 1 | 1 | R | R | | 6 | 5 | | | | | | 7 | | | 4.1% |
| *Fusconaia flava* | R | | | | | | | R | | | R | | | | | | | | | | | | - |
| *Megalonaias nervosa* | | | | | | | | | | | | | 1 | | | | | | | | | | 0.1% |
| *Pleurobema sintoxia* | | | R | | | | | | | | | | | | | | | | | | | | - |
| *Quadrula nodulata* | | | | | | | | D | | | | | | | | | | | | | | | - |
| *Quadrula quadrula* | | | | 19 | | | 22 | 5 | | R | | | 15 | 13 | | | 1 | 2 | | 4 | | | 11.1% |
| *Tritogonia verrucosa* | | | | 1 | | | 1 | D | | | | | | | | | R | | | 1 | | | 0.4% |
| *Uniomerus tetralasmus* | | | | | | | | | | | | R | | | D | R | R | R | | | | | - |
| **Subfamily Lampsilinae** | | | | | | | | | | | | | | | | | | | | | | | |
| *Lampsilis cardium* | R | | | | | | | | | | | | | | | | | | | | | | - |
| *Lampsilis siliquoidea* | | | | | R | | | R | | | R | | | | | | R | | R | | | | - |
| *Lampsilis teres* | R | | | | | | R | R | | R | D | | R | 4 | | | 5 | | | R | 2 | | 1.5% |
| *Leptodea fragilis* | 1 | R | | 3 | | | 8 | 8 | 1 | | R | | 7 | 17 | | | 8 | | | 5 | 4 | D | 8.5% |
| *Ligumia subrostrata* | R | 1 | | | | | | R | 4 | R | | | | | 26 | | | | | | | | 4.2% |
| *Obliquaria reflexa* | | | | 1 | | | 1 | D | | | | | | 1 | | | | | | | | | 0.4% |
| *Potamilus alatus* | | | | | | | 17 | 16 | | | | | 7 | 5 | | | | | | | | | 6.2% |
| *Potamilus ohiensis* | D | R | D | 16 | | | | | 2 | | R | | 1 | 9 | | | 1 | 1 | | 7 | | R | 5.1% |
| *Toxolasma parvum* | | 1 | R | 215 | R | | | | 1 | | | 1 | 2 | | 2 | | | R | R | | 3 | | 30.8% |
| *Truncilla donaciformis* | | | | 17 | | | | | | | | | 3 | 2 | | | R | | | | | | 3.0% |
| *Truncilla truncata* | | | | 2 | | | | 1 | | | | | 8 | 14 | | | | | | | | | 3.4% |
| | | | | | | | | | | | | | | | | | | | | | | | **Totals** |
| **Individuals collected** | 1 | 2 | 0 | 298 | 0 | 0 | 68 | 34 | 11 | 0 | 0 | 1 | 114 | 107 | 30 | 0 | 24 | 4 | 0 | 24 | 13 | 0 | 731 |
| **Live species collected** | 1 | 2 | 0 | 11 | 0 | 0 | 7 | 6 | 7 | 0 | 0 | 1 | 11 | 12 | 3 | 0 | 5 | 3 | 0 | 5 | 6 | 0 | 18 |
| **Extant species** | 2 | 3 | 1 | 11 | 0 | 0 | 7 | 10 | 8 | 0 | 1 | 1 | 11 | 12 | 4 | 0 | 6 | 3 | 0 | 5 | 6 | 1 | 20 |
| **Total species collected** | 7 | 6 | 6 | 11 | 3 | 1 | 10 | 14 | 8 | 5 | 6 | 2 | 13 | 12 | 4 | 1 | 10 | 5 | 3 | 8 | 6 | 3 | 26 |
| **Historical species richness** | NDA | NDA | NDA | NDA | NDA | NDA | NDA | NDA | NDA | 2 | 1 | NDA | 4 | 1 | NDA | NDA | 2 | NDA | NDA | NDA | NDA | 1 | |
| **Catch per unit effort (CPUE)** | 0.25 | 0.5 | 0 | 74.5 | 0 | 0 | 17 | 8.5 | 2.75 | 0 | 0 | 0.25 | 28.5 | 26.75 | 7.5 | 0 | 6 | 1 | 0 | 6 | 3.25 | 0 | |
| **Mussel Community Index (MCI)** | 4 | 4 | 0 | 16 | 0 | 0 | 9 | 9 | 10 | 0 | 0 | 4 | 13 | 13 | 11 | 0 | 7 | 6 | 0 | 9 | 11 | 0 | |
| **Resource Classification** | R | R | R | U | R | R | M | M | M | R | R | R | HV | HV | M | R | L | L | R | M | M | R | |

d. All Illinois River Tributary sites (70 total sites) sampled from 2009-2012. **Actinonaias ligamentina* and *Anodonta suborbiculata* are included in the historical species but are not represented in the table.

| Species | Total individuals | No. sites live | No. sites extant | No. sites relict | Proportion of total live |
|---|---|---|---|---|---|
| **Subfamily Anodontinae** | | | | | |
| *Alasmidonta marginata* | 0 | 0 | 0 | 2 | 0.0% |
| *Alasmidonta viridis* | 75 | 1 | 2 | 5 | 6.9% |
| *Anodontoides ferussacianus* | 37 | 5 | 8 | 19 | 3.4% |
| *Arcidens confragosus* | 1 | 1 | 1 | 2 | 0.1% |
| *Lasmigona complanata* | 153 | 15 | 21 | 31 | 14.2% |
| *Lasmigona compressa* | 5 | 4 | 8 | 16 | 0.5% |
| *Lasmigona costata* | 0 | 0 | 0 | 2 | 0.0% |
| *Pyganodon grandis* | 70 | 7 | 15 | 22 | 6.5% |
| *Strophitus undulatus* | 11 | 5 | 7 | 13 | 1.0% |
| *Utterbackia imbecillis* | 12 | 4 | 5 | 5 | 1.1% |
| **Subfamily Ambleminae** | | | | | |
| *Amblema plicata* | 35 | 8 | 9 | 21 | 3.2% |
| *Elliptio dilatata* | 0 | 0 | 0 | 2 | 0.0% |
| *Fusconaia flava* | 0 | 0 | 0 | 5 | 0.0% |
| *Megalonaias nervosa* | 1 | 1 | 1 | 1 | 0.1% |
| *Pleurobema sintoxia* | 0 | 0 | 0 | 2 | 0.0% |
| *Quadrula nodulata* | 0 | 0 | 1 | 1 | 0.0% |
| *Quadrula quadrula* | 83 | 9 | 9 | 11 | 7.7% |
| *Tritogonia verrucosa* | 3 | 3 | 4 | 5 | 0.3% |
| *Uniomerus tetralasmus* | 2 | 2 | 4 | 10 | 0.2% |
| **Subfamily Lampsilinae** | | | | | |
| *Lampsilis cardium* | 3 | 3 | 6 | 10 | 0.3% |
| *Lampsilis siliquoidea* | 39 | 3 | 3 | 18 | 3.6% |
| *Lampsilis teres* | 11 | 3 | 4 | 10 | 1.0% |
| *Leptodea fragilis* | 89 | 16 | 23 | 29 | 8.2% |
| *Ligumia subrostrata* | 31 | 3 | 3 | 7 | 2.9% |
| *Obliquaria reflexa* | 3 | 3 | 4 | 4 | 0.3% |
| *Potamilus alatus* | 47 | 5 | 7 | 7 | 4.4% |
| *Potamilus ohiensis* | 40 | 8 | 14 | 19 | 3.7% |
| *Toxolasma parvum* | 233 | 12 | 15 | 22 | 21.6% |
| *Truncilla donaciformis* | 22 | 3 | 3 | 5 | 2.0% |
| *Truncilla truncata* | 25 | 4 | 6 | 6 | 2.3% |
| *Venustaconcha ellipsiformis* | 58 | 3 | 5 | 13 | 5.4% |
| | | | | | Totals |
| | | | | **Individuals collected** | 1089 |
| | | | | **Live species collected** | 25 |
| | | | | **Extant species collected** | 26 |
| | | | | **Total species collected** | 31 |
| | | | | **Historical species (collected prior to 2009)** | 27* |

**Table 3.** Mussel Community Index (MCI) parameters and scores.

| Extant species in sample | Species Richness | | Catch per Unit Effort (CPUE) | Abundance (AB) Factor |
|---|---|---|---|---|
| 0 | 1 | | 0 | 0 |
| 1-3 | 2 | | 1-10 | 2 |
| 4-6 | 3 | | >10-30 | 3 |
| 7-9 | 4 | | >30-60 | 4 |
| 10+ | 5 | | >60 | 5 |
| % live species with recent recruitment | Reproduction Factor | | # of Intolerant species | Intolerant species Factor |
| 0 | 1 | | 0 | 1 |
| 1-30 | 3 | | 1 | 3 |
| >30-50 | 4 | | 2+ | 5 |
| >50 | 5 | | | |

**Table 4.** Freshwater mussel resource categories based on species richness, abundance, and population structure. MCI = Mussel Community Index Score

| | |
|---|---|
| Unique Resource<br>MCI ≥ 16 | Very high species richness (10 + species) &/or abundance (CPUE > 80); intolerant species typically present; recruitment noted for most species |
| Highly Valued Resource<br>MCI 12 - 15 | High species richness (7-9 species) &/or abundance (CPUE 51-80 ); intolerant species likely present; recruitment noted for several species |
| Moderate Resource<br>MCI = 8 - 11 | Moderate species richness (4-6 species) &/or abundance (CPUE 11-50) typical for stream of given location and order; intolerant species likely not present; recruitment noted for a few species |
| Limited Resource<br>MCI = 5 - 7 | Low species richness (1-3 species) &/or abundance (CPUE 1-10); lack of intolerant species; no evidence of recent recruitment (all individuals old or large for the species) |
| Restricted Resource<br>MCI = 0 - 4 | No live mussels present; only weathered dead, sub-fossil, or no shell material found |

**Figure 1**. Variation in aquatic habitats, including seasonal desiccation (top, Cedar Creek, site 8) and soft substrates with mobile woody debris (bottom, McKee Creek, site 48).

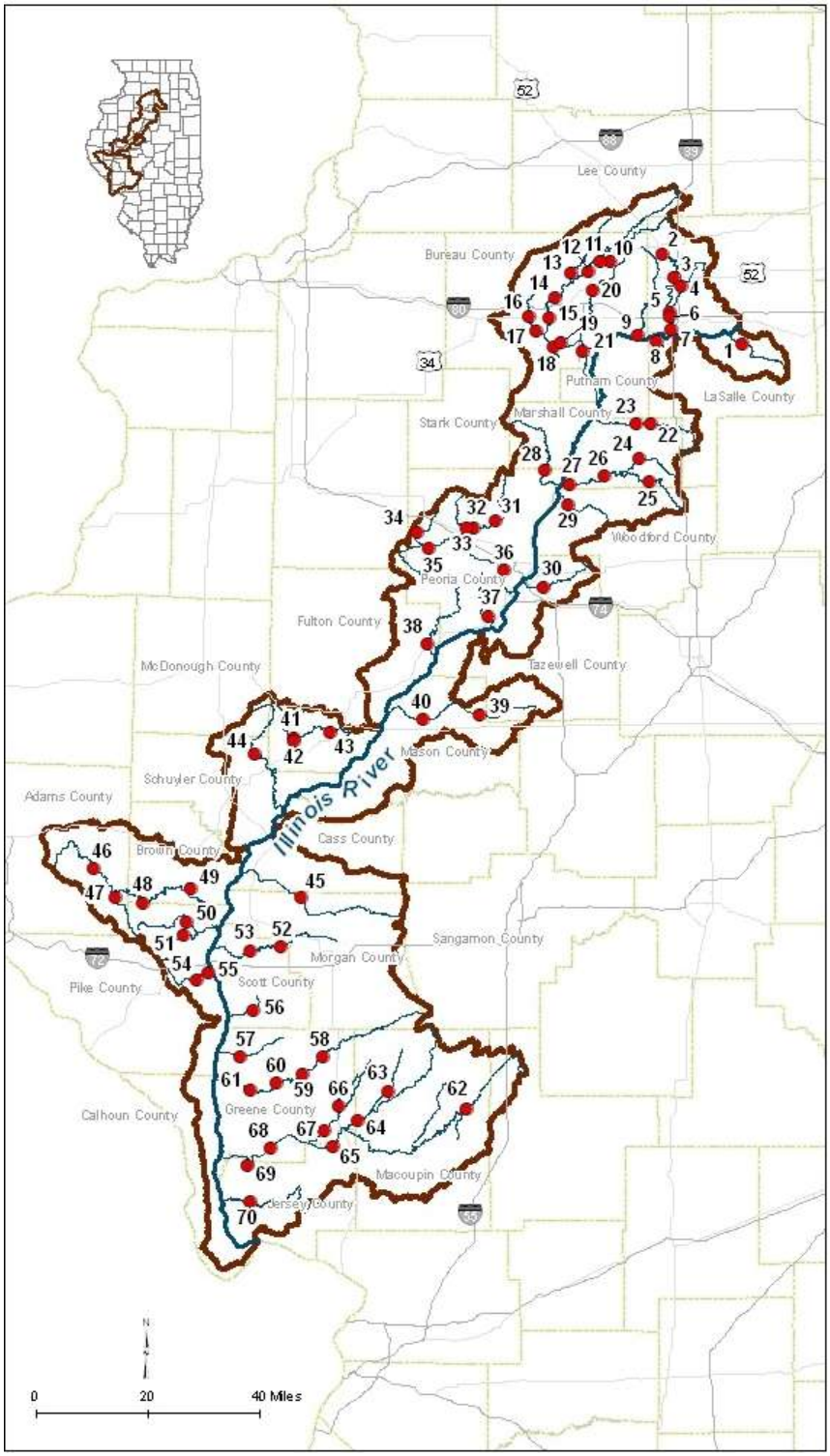


**Figure 2.** Sites sampled in the Illinois River tributaries: Upper, Middle, Lower drainages in 2009 - 2012. Site codes referenced in Table 1.

**Figure 3a.** Upper Illinois Tributaries

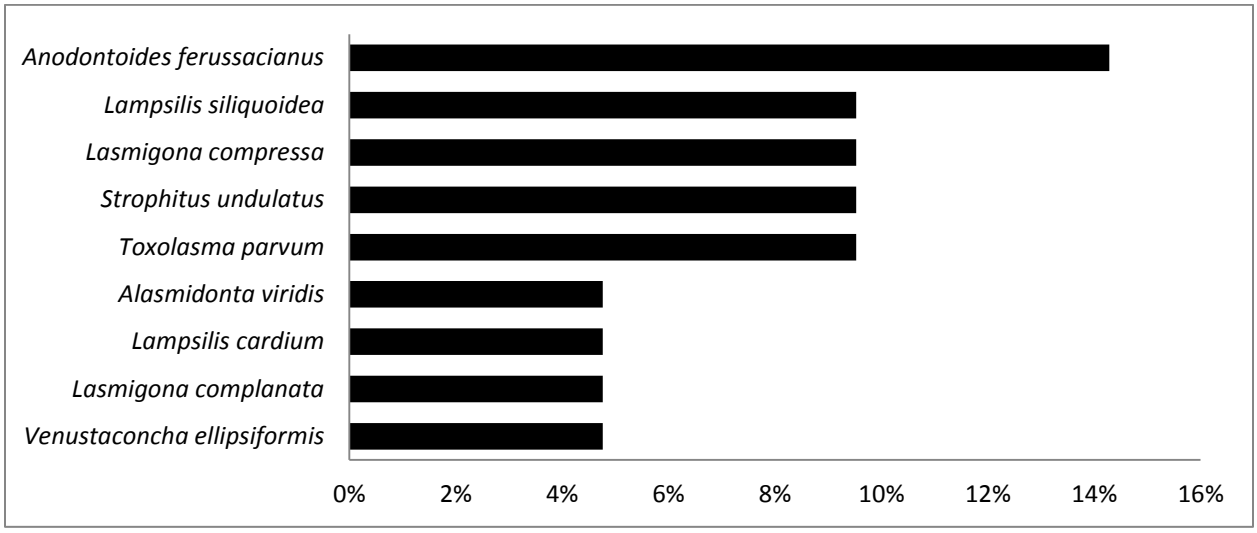


**Figure 3b.** Middle Illinois Tributaries

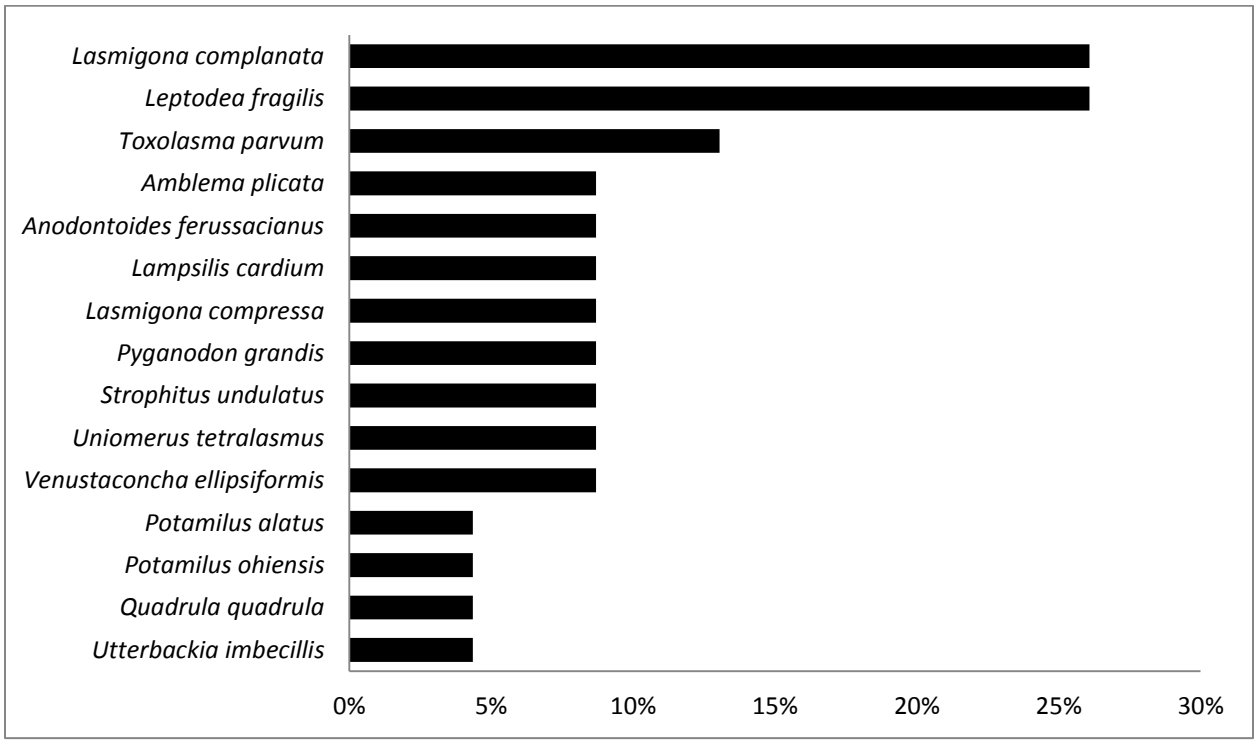

**Figure 3c.** Lower Illinois Tributaries

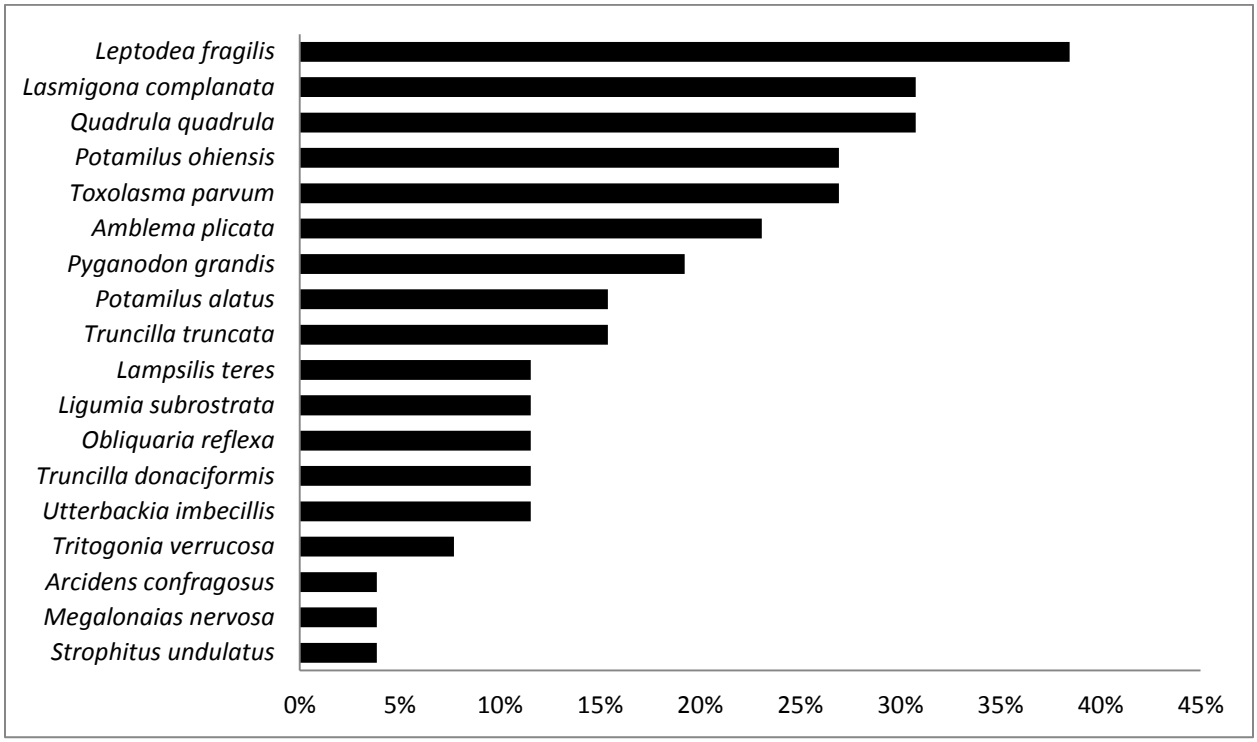


**Figure 3.** Number of sites where a species was collected live compared to the total number of sites sampled in the Upper Illinois Tributaries (a. 21 sites), Middle Illinois Tributaries (b. 23 sites) and Lower Illinois Tributaries (c. 26 sites).

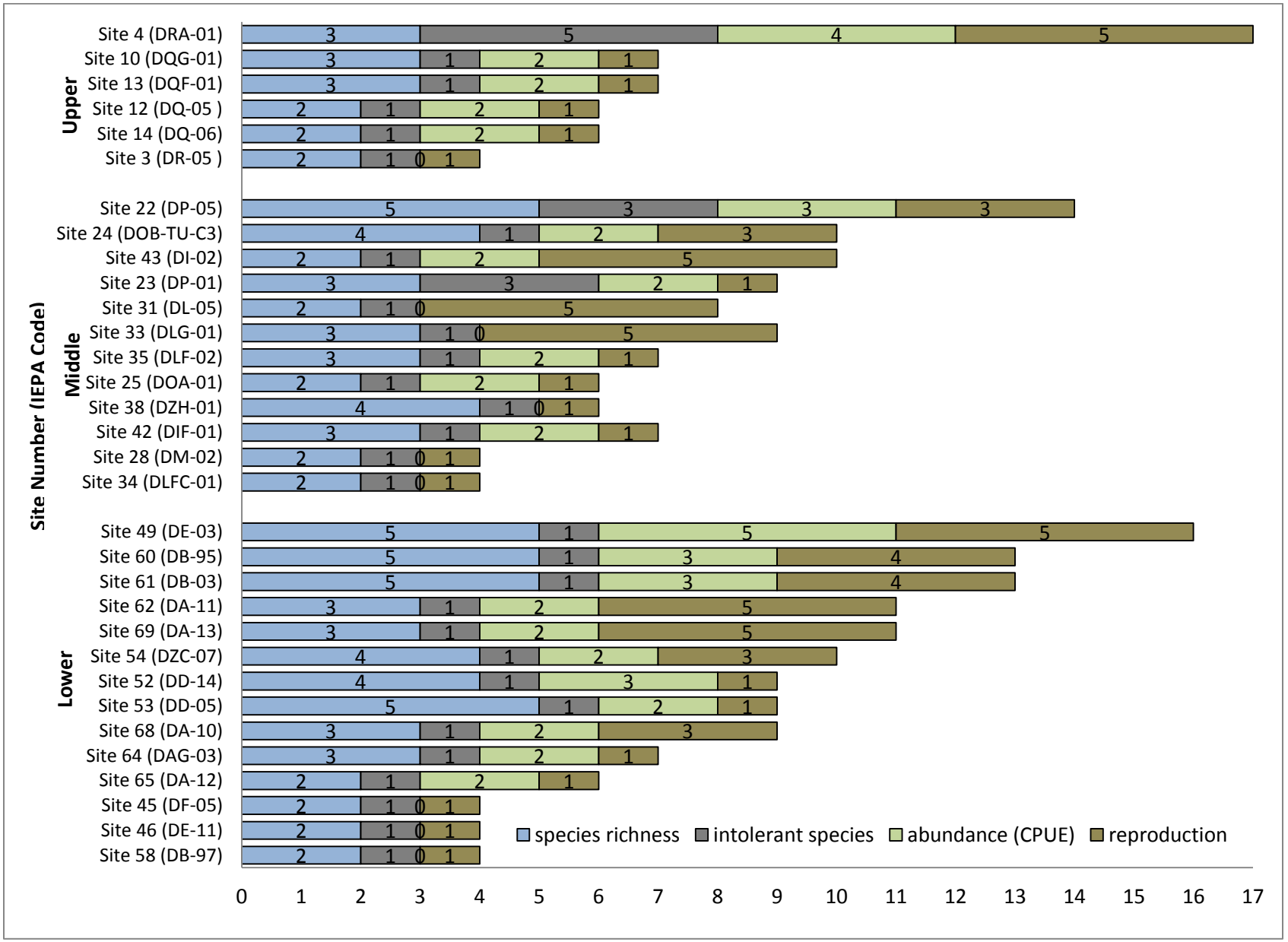


**Figure 4.** Comparison of Mussel Community Index (MCI) and MCI component scores for Illinois River tributary sites based factor values from Table 3.

Appendix 1. Scientific and common names of species. Status (in 2013): SGNC-Illinois' species in greatest need of conservation, ST-state threatened.

| Scientific name | Common name | Status |
|---|---|---|
| **Subfamily Anodontinae** | | |
| *Alasmidonta marginata* | elktoe | |
| *Alasmidonta viridis* | slippershell mussel | ST |
| *Anodonta suborbiculata* | flat floater | |
| *Anodontoides ferussacianus* | cylindrical papershell | |
| *Arcidens confragosus* | rock pocketbook | SGNC |
| *Lasmigona complanata* | white heelsplitter | |
| *Lasmigona compressa* | creek heelsplitter | SGNC |
| *Lasmigona costata* | flutedshell | SGNC |
| *Pyganodon grandis* | giant floater | |
| *Strophitus undulatus* | creeper | |
| *Utterbackia imbecillis* | paper pondshell | |
| **Subfamily Ambleminae** | | |
| *Amblema plicata* | threeridge | |
| *Elliptio dilatata* | spike | ST |
| *Fusconaia flava* | Wabash pigtoe | |
| *Megalonaias nervosa* | washboard | |
| *Pleurobema sintoxia* | round pigtoe | |
| *Quadrula nodulata* | wartyback | |
| *Quadrula quadrula* | mapleleaf | |
| *Tritogonia verrucosa* | pistolgrip | |
| *Uniomerus tetralasmus* | pondhorn | |
| **Subfamily Lampsilinae** | | |
| *Actinonaias ligamentina* | mucket | |
| *Lampsilis cardium* | plain pocketbook | |
| *Lampsilis siliquoidea* | fatmucket | |
| *Lampsilis teres* | yellow sandshell | |
| *Leptodea fragilis* | fragile papershell | |
| *Ligumia subrostrata* | pondmussel | |
| *Obliquaria reflexa* | threehorn wartyback | |
| *Potamilus alatus* | pink heelsplitter | |
| *Potamilus ohiensis* | pink papershell | |
| *Toxolasma parvum* | lilliput | |
| *Truncilla donaciformis* | fawnsfoot | |
| *Truncilla truncata* | deertoe | |
| *Venustaconcha ellipsiformis* | ellipse | SGNC |